

AE/CoC-Pack02	<b>Packaging Guideline</b>	Version 1.1	Page 1/13
From Packaging CoC	<b>Packaging Logistic Instruction for PCB Deliveries</b>	Issued by: Packaging CoC	Date August 18, 2022

## Table of contents

1	Scope .....	2
2	Terms .....	2
3	First level packaging .....	2
3.1	Packaging of printed boards .....	2
3.2	Packaging of HSP boards .....	5
4	External and transport packaging.....	6
4.1	Packing in cardboard boxes.....	6
4.2	Protection against external physical impacts.....	6
4.3	Stackability of loading units.....	7
4.4	Pallet labeling .....	9
4.5	Fill level.....	9
5	Specific requirements depending on transportation type .....	10
5.1	Land and air freight.....	10
5.2	Sea freight .....	10
5.3	Allowed Packaging Type.....	11
5.4	Criteria of mixed deliveries.....	11
6	Aspects to consider.....	12
7	Modification history .....	13

AE/CoC-Pack02	<b>Packaging Guideline</b>	Version 1.1	Page 2/13
From Packaging CoC	<b>Packaging Logistic Instruction for PCB Deliveries</b>	Issued by: Packaging CoC	Date August 18, 2022

## 1 Scope

This guideline describes the handling, packaging, and shipping method for PCBs, how to protect the materials against damages as well avoiding quality loss due to environmental influences. This guideline helps to understand the Bosch requirements, in terms of how the PCB must be packed.

The SUPPLIER is responsible for the quality of its products and for ensuring compliance with the requirements and rules set out in this packaging guideline. The SUPPLIER shall design the packaging concept such as to ensure product integrity during transport, transshipment, and storage.

The packaging concept proposed by SUPPLIER is subject to approval by BOSCH prior to the first delivery.

## 2 Terms

ESD: Electrostatic Discharge

PCB: Printed Circuit Board

MBB: Moisture Barrier Bag

WVTR: The water vapor transmission rate

PP: Polypropylene

PET: Polyethylene terephthalate

PE: Polyethylene

## 3 First level packaging

### 3.1 Packaging of printed boards

Packaging and handling of printed boards must be in accordance with the standard IPC 1602. The printed boards should be packed in piles of 20 boards per package, all in the same orientation. The complete pile must not be higher than 40 mm. Once per lot, one package with a residual amount of boards can be shipped, wearing a yellow label: "last pieces".

Printed boards shall be protected from contamination. Visible particles and fibers are not allowed in the package (Ref. Fig. 1).

AE/CoC-Pack02	<b>Packaging Guideline</b>	Version 1.1	Page 3/13
From Packaging CoC	<b>Packaging Logistic Instruction for PCB Deliveries</b>	Issued by: Packaging CoC	Date August 18, 2022



*Figure 1: Fibers found in packages.*

The printed boards shall be packed in solid PE/PET foil to create a solid stack (Ref. Fig. 2). The PE/PET packages must be easy to open without the need for tools. It is not allowed to open the PE/PET packages by pulling the foil over the corner or to scratch the package edge against an object.



*Figure 2: Stack of PCBs packed in a PE/PET foil.*

The PE/PET foil packages shall be packed in a sealed moisture barrier bag (MBB) (Ref. Fig. 3), which shall refer to IPC 1602 requirements for flexibility, electrostatic discharge protection, mechanical strength, and puncture resistance.



*Figure 3: PE/PET foil packages packed in a sealed moisture barrier bag (MBB).*

AE/CoC-Pack02	<b>Packaging Guideline</b>	Version 1.1	Page 4/13
From Packaging CoC	<b>Packaging Logistic Instruction for PCB Deliveries</b>	Issued by: Packaging CoC	Date August 18, 2022

The water vapor transmission rate (WVTR) and ESD requirements as per IPC 1602 shall be fulfilled for all MBB packages and they need to wear the following signs (Ref. Fig. 4):



*Figure 4: Moisture sensitive devices and ESD sign.*

The MBBs must be vacuumed and not be damaged during the vacuuming process and must be securely closed until the time of arrival at the respective Bosch plant.

The MBB bag shall have an “easy to open groove” which allows operators at Bosch production lines to open the bags without the necessity to use any tool (Ref. Fig. 5).



*Figure 5: Example of “V” cut shape for opening the MBB bag.*

All packages shall be equipped with a package of desiccant which refers to IPC 1602 requirements. The desiccant must be placed at the side of the stack and must not touch the PCB surface. (Ref. Fig. 6).



*Figure 6: Desiccant bag placement.*

A MAT-Label according to the latest version of the labeling instruction shall be placed on top of each package.

MAT-Label in currently applicable version applies: <https://www.bosch.com/company/supply-chain/information-for-business-partners/#logistics-regulations-and-standards>

AE/CoC-Pack02	<b>Packaging Guideline</b>	Version 1.1	Page 5/13
From Packaging CoC	<b>Packaging Logistic Instruction for PCB Deliveries</b>	Issued by: Packaging CoC	Date August 18, 2022

### 3.2 Packaging of HSP boards

The HSP boards should be packed in piles of 10 printed boards per package, all in the same orientation using a minimum of 200 µm PE/PET foil thickness to separate the boards into the package (Ref. Fig. 7).



Figure 7: Separating layers between printed boards.

All separating layers should preferably be welded so that they can be easily removed all at once (Ref. Fig. 8).

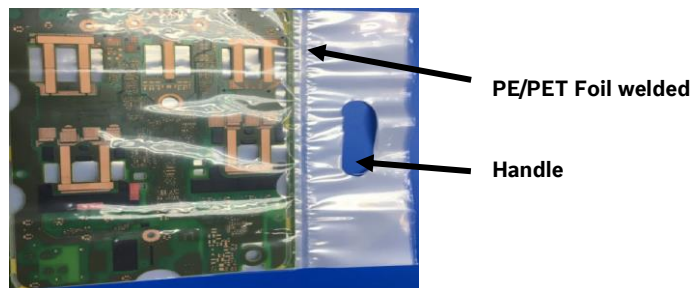


Figure 8: Separation foil design.

All printed boards shall be packed in solid PET/PE-foil to create a solid stack and a sealed moisture barrier bag (MBB) (Ref. Fig. 9).



Figure 9: Solid stack of printed boards packed in a sealed moisture barrier bag (MBB).

All other requirements from chapter "3.1 Packaging of printed boards" must be followed.

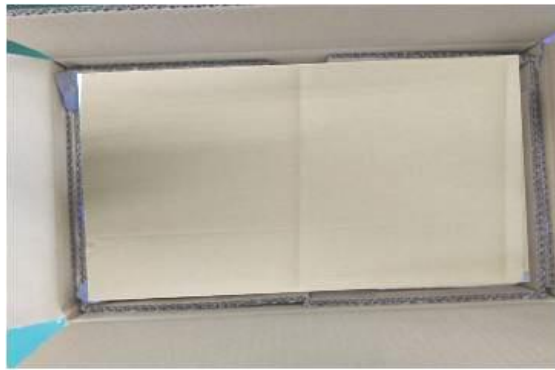
AE/CoC-Pack02	<b>Packaging Guideline</b>	Version 1.1	Page 6/13
From Packaging CoC	<b>Packaging Logistic Instruction for PCB Deliveries</b>	Issued by: Packaging CoC	Date August 18, 2022

## 4 External and transport packaging

All packaging shall be designed so that it fulfills the relevant requirements:

### 4.1 Packing in cardboard boxes

Packages containing the shipping panels are placed in a solid cardboard box of at least 5mm thickness, reinforced with 10mm cardboard on top of the upper PCB package (Ref. Fig. 10). Maximum load of a cardboard box is 15kg. Free space of the cardboard box must be filled with eco-friendly materials (e.g. non-plastic materials) in a way that the packages can't shake or move in the box.



*Figure 10: Reinforced cardboard on top of the MBB bags.*

Only one P/N can be in one box, no mixing. Supplier-shipping-label must be placed on the short outside of the cardboard box.

Fully packed cardboard boxes need to be able to pass the described vibration and drop test in specification **ISTA test procedure 3A\_2018**.

Pass criteria: The MBBs must remain intact and vacuumed.

### 4.2 Protection against external physical impacts

- Protection against damage through an outer cardboard box and secure of the handling unit in the cardboard box.
- Outer box should have "wet-strength adhesive/water-resistant adhesive".
- Protection against corrosion and humidity.
- Only polypropylene (PP) or Polyethylene (PET) straps are, in general, permitted. The use of stretch or shrink foil shall be specially agreed on.

AE/CoC-Pack02	<b>Packaging Guideline</b>	Version 1.1	Page 7/13
From Packaging CoC	<b>Packaging Logistic Instruction for PCB Deliveries</b>	Issued by: Packaging CoC	Date August 18, 2022

### 4.3 Stackability of loading units

All pallet loads must be stackable and must withstand the transport conditions for different types of shipments: air, sea, road, and rail.

Fully packed pallets need to be able to pass the described test sequences in specification **ISTA test procedure 3E\_2017**.

Pass criteria: The MBBs must remain intact and vacuumed, and the overall pallet load must remain intact without any damages or deformations.

It is mandatory to use loading units with a dynamic stacking factor of at least = 2 (1+1) to reduce freight costs and reduce environmental impact (Ref. Fig. 11).



*Figure 11: Dynamic stacking factor at least = 2 (1+1).*

- Max.gross weight of 1000 kg per pallet (Plant specific definition is possible)
- Max.gross weight up to 15 kg per manually handled loading unit (Plant specific definition is possible)

An outside cardboard pallet box is needed to have sufficient strength during the transport and to deliver the parts in a safe way avoiding damage (Ref. Fig. 12).

AE/CoC-Pack02	<b>Packaging Guideline</b>	Version 1.1	Page 8/13
From Packaging CoC	<b>Packaging Logistic Instruction for PCB Deliveries</b>	Issued by: Packaging CoC	Date August 18, 2022



*Figure 12: Cardboard pallet box example.*

Avoid the usage of stretch foil.  
All boxes must be secured and delivered on pallets.  
It is not permitted to deliver single boxes without assuring them on a pallet.

Stacked pallets without additional protection are not accepted (Ref. Fig. 13).





AE/CoC-Pack02	<b>Packaging Guideline</b>	Version 1.1	Page 9/13
From Packaging CoC	<b>Packaging Logistic Instruction for PCB Deliveries</b>	Issued by: Packaging CoC	Date August 18, 2022



Figure 13: Damages due to wrong palletization and lack of exterior protection.

#### 4.4 Pallet labeling

All pallets stackable and not stackable must be labeled accordingly (Ref. Fig. 14).

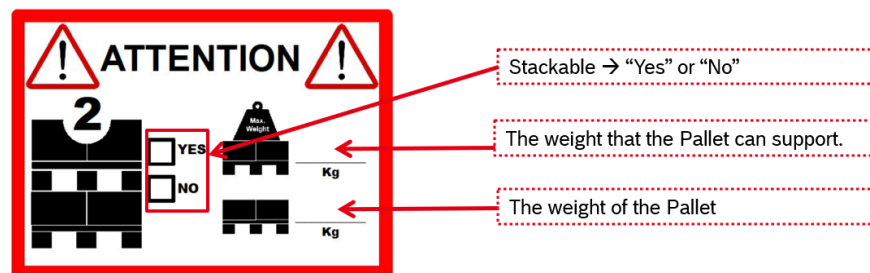


Figure 14: Labeling of pallets.

Incomplete pallets or a remaining quantity of boxes that cannot be prepared in a stackable way must be arranged on a pallet and labeled, marked **“Not stackable”**.

Incomplete pallets must be stacked on top of the stackable pallets during transport.

#### 4.5 Fill level

The fill level of the packaging must be optimized for a fully extended level.

- Unfilled level on a pallet is not allowed.
- In case shipping does not meet the level of a pallet, it must be extended with empty boxes.
- Empty boxes need to be placed in the middle of the pallet to avoid damage and collapse of the pallets during stacking (Ref. Fig. 15).

AE/CoC-Pack02	<b>Packaging Guideline</b>	Version 1.1	Page 10/13
From Packaging CoC	<b>Packaging Logistic Instruction for PCB Deliveries</b>	Issued by: Packaging CoC	Date August 18, 2022

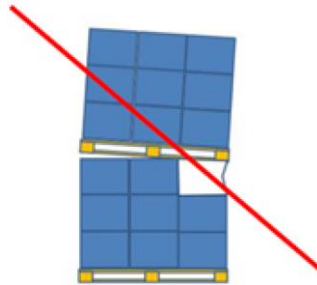


Figure 15: Wrong placement of empty box.

## 5 Specific requirements depending on transportation type

### 5.1 Land and air freight

Preferred external dimensions: L1200 x W800 x H1000 mm.  
For air freight, the use of sea freight pallets is also permitted.

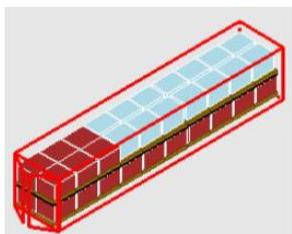
### 5.2 Sea freight

Due to long transportation distances and times, and changing requirements (climatic zones, mechanical stress, moisture, etc.), special attention must be given to ensure suitable packaging for sea freight.

The objective is to use loading units with dimensions optimized for sea container loading to reduce freight costs.

Acceptable external dimensions for optimum utilization of shipping container loading volume:

- L1175 x W750 x H460/750/1045 mm
- L1140 x W790 x H460/750/1045 mm
- L1140 x W980 x H460/750/1045 mm



	Name	Length (mm)	Width (mm)	Height (mm)	Weight (kg)	Q-ty	Color
	Cargo1	1140	790	750	600	14	Lightblue
	Cargo2	1140	980	750	500	26	Brown

Use of outer cardboards with moisture-proof / waterproof adhesive.

AE/CoC-Pack02	<b>Packaging Guideline</b>	Version 1.1	Page 11/13
From Packaging CoC	<b>Packaging Logistic Instruction for PCB Deliveries</b>	Issued by: Packaging CoC	Date August 18, 2022

Small cardboard box (for example 400 x 300 mm) is to be combined and protected using a filled larger external cardboard pallet box.

The loading volume of the shipping container should be completely utilized.

### 5.3 Allowed Packaging Type

Maximum external load dimension per unit should be defined according to the packaging type and transport mode.

- Returnable (*only in dedicated cases*)
- Expendable, depending on transport mode (Land and Air freight, Sea freight)

### 5.4 Criteria of mixed deliveries

Generally, mixed deliveries on a pallet are allowed. Following criteria need to be considered: The total shipped quantities of a material must be packed with the same expiring date in one packaging unit without spreading it in several units (Ref. Fig. 16).

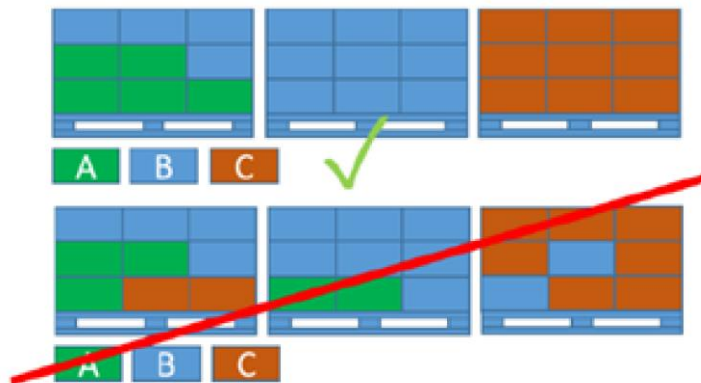


Figure 16: Mixed deliveries criteria.

After maximum quantity of a packaging unit is reached, remain quantity can be packed into a second one. In case different materials with different expire dates will be packaged into one packaging unit, levels need to be divided with a paper separator to be easily identified.

The different expiration dates need to be visible on the outside cardboard box.

The label on the outer box needs to follow the standard label specification. (See Logistics Supplier Manual):

<https://www.bosch.com/company/supply-chain/information-for-business-partners/#logistics-regulations-and-standards>

AE/CoC-Pack02	<b>Packaging Guideline</b>	Version 1.1	Page 12/13
From Packaging CoC	<b>Packaging Logistic Instruction for PCB Deliveries</b>	Issued by: Packaging CoC	Date August 18, 2022

## 6 Aspects to consider

Overpacking – reduce unnecessary packaging materials.

Avoid non-recyclable packaging materials used.

Reduction of plastic usage, increase recyclable content of the packaging materials used.

- Easy to open and re-close.
- Easy to repack.
- Environmentally friendly.
- Easy to dispose of.
- Hygienic.
- All the packaging materials must be identified with the respective standard recycling code and material family.
- Without metal clamps, metal clips, or metal staples for employee safety reasons (Ref. Fig. 17).



*Figure 17: Example of not allowed metal staples.*

AE/CoC-Pack02	<b>Packaging Guideline</b>	Version <b>1.1</b>	Page <b>13/13</b>
From Packaging CoC	<b>Packaging Logistic Instruction for PCB Deliveries</b>	Issued by: Packaging CoC	Date August 18, 2022

## 7 Modification history

Version	Date	Author	Change / Remarks
1.0	19.08.2019	Packaging CoC	First edition
1.1	18.08.2022	Packaging CoC	HSP PCB packaging criteria